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$^{40}\text{Ar}/^{39}\text{Ar}$ Age-spectrum Data for
Metamorphic and Plutonic Rocks from West-central Idaho

By

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This report is preliminary and has not been reviewed
for conformity with U.S. Geological Survey editorial
standards and stratigraphic nomenclature. Any use
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Introduction

This report presents $^{40}\text{Ar}/^{39}\text{Ar}$ age-spectrum data for minerals from metamorphic and plutonic rocks from west-central Idaho. The minerals were analyzed to provide an isotopic age constraint on regional metamorphism and to test hypotheses on the relationship between metamorphism and plutonism along the western margin of the Idaho batholith. The geology of the area is described in Hamilton (1963), Onasch (1977), Vallier (1977), Balcer (1980), and Lund (1984). The data form the temporal foundation for a study of the tectonic development of the area (Lund and Snee, in press).

Techniques

Sample collection and mineral separation

Two groups of samples composed of 12 from the Hells Canyon area and 36 from the Salmon River, Little Salmon River, and Slate Creek areas were collected from a 1,600-square-mile area. These 48 samples were collected to be representative of metamorphic rocks of the Riggins Group and the Seven Devils island arc, metamorphic rocks of uncertain affiliation, plutons of the Idaho batholith, and plutons of uncertain affiliation as exposed in the sample area. Thin sections were prepared for each sample and studied petrographically. Samples were examined to determine the character of hornblende, biotite, muscovite, and potassium-feldspar with particular attention to grain size, alteration, intergrowths of other potassium-bearing phases, presence of overgrowths of other minerals, multiple generations of minerals, and structural state of the potassium-feldspar. From these 48 samples, 36 were selected for preparation of mineral separates. Sample locations are listed in table 1.

Samples were crushed, pulverized, sized, and washed in tap water. Grain size used for mineral separates ranged from 125 to 250 μm . Purified mineral separates of hornblende, biotite, muscovite, and microcline were then obtained using one or more of the following: heavy liquids, magnetic separation, and paper friction. After hand-picking to ensure 99.9 percent purity, mineral separates were washed in acetone, ethyl alcohol, and distilled water, and dried at 100 °C for 30 to 60 minutes. A total of 30 hornblende, 9 biotite, 5 muscovite, and 3 microcline separates were prepared for dating.

$^{40}\text{Ar}/^{39}\text{Ar}$ analysis

After purification, approximately 0.08 g microcline, 0.06 g biotite, 0.07 g muscovite, and 0.75 g hornblende were loaded into aluminum capsules. The sample capsules along with several capsules of a primary flux monitor were loaded in an irradiation container. The primary flux monitor for the experiment was hornblende MMHb-1 with percent- K^+ = 1.555 +/- 0.001, $^{40}\text{Ar}_R$ = $1.624 +/- 0.005 \times 10^{-9}$ mol/g, and K/Ar age = 519.5 m.y. (Alexander and others, 1978). Irradiation was done in the central thimble of the USGS reactor in Denver. Details of this approach, including type of container and geometry of samples and standards, are summarized in Snee and others (1985 and in press). Total time of irradiation was 30 hours to ensure optimum Ar ratios for samples and monitors.

Argon analysis for most samples was done on a VG Instruments MM1200B mass spectrometer in the USGS Isotope Laboratories, Reston, Virginia; some samples were analyzed on a Nuclide Corporation, Model SGA-6-60 gas-source, 6-inch, 60°

sector mass spectrometer at The Ohio State University. Details of sample heating, argon purification, and mass spectrometric analysis are similar to those presented in Snee and others (1985 and in press). $^{40}\text{Ar}/^{39}\text{Ar}$ ages and associated errors were calculated as described by Dalrymple and others (1981). Decay constants used in this study are those recommended by Steiger and Jäger (1977). These constants are $\lambda_{\epsilon} = 0.581 \times 10^{-10}/\text{yr}$, $\lambda_{\beta^-} = 4.962 \times 10^{-10}/\text{yr}$, $\lambda = \lambda_{\epsilon} + \lambda_{\beta^-} = 5.543 \times 10^{-10}/\text{yr}$, and $^{40}\text{Ar}/^{39}\text{Ar}$ atmosphere = 295.5. Plateau ages are the average of all temperature fractions that define a plateau. All contiguous temperature fractions whose ages agree with each other as determined by the Critical Value Test (Dalrymple and Lanphere, 1969) are used in the plateau-age calculation. Details on determining plateau ages and associated errors are presented in Snee and others (in press).

$^{40}\text{Ar}/^{39}\text{Ar}$ age-spectrum data are compiled in table 2.

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Table 1

Sample Locations

Sample	Mineral ¹	Quadrangle ²	Locations
R3	mu	Kessler Ck	45° 23' 26" N, 116° 25' 14" W, SE 1/4 Sec 26, T24N, R1E, Idaho County, Idaho
R7	hb	Riggins	45° 24' 30" N, 116° 20' 13" W, NE 1/4 Sec 21, T24N, R1E, Idaho County, Idaho
R8a	mu, bi, mi	Burgdorf	45° 27' 30" N, 115° 54' 29" W, not surveyed, Idaho County, Idaho
R10	mu	Kelly Mtn	45° 25' 23" N, 116° 01' 55" W, NE 1/4 Sec 13, T24N, R3E, Idaho County, Idaho
R11	hb	Riggins Hot Springs	45° 24' 35" N, 116° 07' 34" W, NE 1/4 Sec 19, T24N, R3E, Idaho County, Idaho
R12	hb, bi	Riggins Hot Springs	45° 25' 43" N, 116° 08' 34" W, SW 1/4 Sec 7, T24N, R3E, Idaho County, Idaho
R14	hb	Riggins Hot Springs	45° 24' 02" N, 116° 12' 51" W, SE 1/4 Sec 21, T24N, R2E, Idaho County, Idaho
R16	hb, bi	Riggins	45° 24' 46" N, 116° 15' 18" W, SE 1/4 Sec 18, T24N, R2E, Idaho County, Idaho
R17	hb	Riggins	45° 25' 15" N, 116° 16' 48" W, NW 1/4 Sec 13, T24N, R1E, Idaho County, Idaho
R18	hb, bi	Riggins	45° 24' 38" N, 116° 18' 24" W, NW 1/4 Sec 23, T24N, R1E, Idaho County, Idaho
R20	hb	Grave Point	45° 39' 25" N, 116° 23' 54" W, SE 1/4 Sec 24, T24N, R1W, Idaho County, Idaho
R21	hb, bi, mi	Dairy Mtn	45° 37' 58" N, 116° 00' 45" W, not surveyed, Idaho County, Idaho
R22	hb	Florence	45° 37' 22" N, 116° 03' 43" W, NE 1/4 Sec 3, T26N, R3E, Idaho County, Idaho
R23	hb	Dairy Mtn	45° 38' 14" N, 116° 06' 14" W, NE 1/4 Sec 32, T27N, R3E, Idaho County, Idaho
R24	hb, mu, mi	Dairy Mtn	45° 38' 25" N, 116° 07' 18" W, NE 1/4 Sec 31, T27N, R3E, Idaho County, Idaho

Table 1 (Continued)

R25	bi	McKinzie Ck	45° 38' 09" N, 116° 08' 31" W, NE 1/4 Sec 36, T27N, R2E, Idaho County, Idaho
R26	hb, bi	McKinzie Ck	45° 38' 08" N, 116° 11' 36" W, NW 1/4 Sec 34, T27N, R2E, Idaho County, Idaho
R27	hb	McKinzie Ck	45° 38' 07" N, 116° 14' 12" W, NW 1/4 Sec 32, T27N, R2E, Idaho County, Idaho
R28	hb	Bally Mtn	45° 07' 28" N, 116° 17' 40" W, SE 1/4 Sec 26, T21N, R1E, Adams County, Idaho
R29	hb	Indian Mtn	45° 09' 43" N, 116° 17' 54" W, NE 1/4 Sec 14, T21N, R1E, Idaho County, Idaho
R30	hb	Pollock	45° 15' 10" N, 116° 20' 5" W, NE 1/4 Sec 16, T22N, R1E, Adams County, Idaho
R34	hb	Riggins	45° 27' 41" N, 116° 18' 26" W, SW 1/4 Sec 35, T25N, R1E, Idaho County, Idaho
R35	mu	Riggins	45° 29' 17" N, 116° 18' 05" W, NW 1/4 Sec 23, T25N, R1E, Idaho County, Idaho
7-30-5	hb	Indian Mtn	45° 08' 05" N, 116° 16' 56" W, NW 1/4 Sec 25, T21N, R1E, Adams County, Idaho
Hcm-23	hb	Cactus Mtn	45° 49' 26" N, 116° 41' 46" W, NE 1/4 Sec 28, T29N, R3W, Idaho County, Idaho
Hdh-24	hb	Deadhouse Ridge	45° 49' 00" N, 116° 45' 45" W, not surveyed, Wallowa County, Oregon
Hdh-25	hb	Deadhouse Ridge	45° 49' 25" N, 116° 46' 31" W, not surveyed, Wallowa County, Oregon
Hdh-27	hb	Deadhouse Ridge	45° 49' 00" N, 116° 45' 48" W, not surveyed, Wallowa County, Oregon
Hkc-29	bi	Kirkwood Ck	45° 36' 48" N, 116° 27' 35" W, S 1/2 Sec 4, T26N, R1W, Idaho County, Idaho
Hkc-32	hb	Kirkwood Ck	45° 36' 46" N, 116° 27" 35" W, S 1/2 Sec 4, T26N, R1W, Idaho County, Idaho
Hkc-34	hb	Kirkwood Ck	45° 36' 25" N, 116° 27' 35" W, N 1/2 Sec 9, T26N, R1W, Idaho County, Idaho
Hkc-35	hb	Kirkwood Ck	45° 36' 25" N, 116° 27' 35" W, N 1/2 Sec 9, T26N, R1W, Idaho County, Idaho

Table 1 (Continued)

Hkc-36	hb, bi	Kirkwood Ck	45° 36' 36" N, 116° 27' 35" W, N 1/2 Sec 9, T26N, R1W, Idaho County, Idaho
Hkc-37	hb	Kirkwood Ck	45° 36' 36" N, 116° 27' 35" W, N 1/2 Sec 9, T26N, R1W, Idaho County, Idaho
Hcop-39	hb	Copperfield	45° 58' 45" N, 116° 51' 30" W, SE 1/4 Sec 17, T19N, R4W, Adams County, Idaho
Hcop-40	hb	Copperfield	45° 56' 55" N, 116° 50' 45" W, NE 1/4 Sec 21, T5S, R48E, Baker County, Oregon

Notes:

¹ Mineral abbreviations are hb - hornblende, mu - muscovite, and bi - biotite.

² All quadrangles are 7.5 minutes except Burgdorf and Copperfield, which are 15 minutes.

Table 2.-- $^{40}\text{Ar}/^{39}\text{Ar}$ age-spectrum data for samples from west-central Idaho

[Estimate of error (last column) is 1 standard deviation from mean]

TEMP (°C)	$^{40}\text{Ar}/^{39}\text{Ar}$	$^{37}\text{Ar}/^{39}\text{Ar}$	$^{36}\text{Ar}/^{39}\text{Ar}$	^{39}Ar (% of total)	$^{40}\text{Ar}_R$ (%)	^{39}Ar (mole $\times 10^{-13}$)	Apparent K/Ca (mole/mole)	Apparent age and error ($\times 10^6$ yr)
R3 muscovite; J = 0.007387; wt. 0.0226 g								
750	9.403	0.5345	0.0110	3.8	65.7	0.129	0.97	80.6 ± 0.5
875	8.512	0.0266	0.0027	13.3	90.7	0.449	19.5	100.1 ± 0.7
925	8.415	0.0070	0.0015	38.1	94.7	1.29	74.8	103.2 ± 0.5
975	8.569	0.0079	0.0017	21.8	94.2	0.737	66.0	104.5 ± 0.5
1000	10.75	0.2273	0.0089	4.4	75.7	0.148	22.9	105.3 ± 0.6
1050	10.61	0.8400	0.0109	3.6	70.3	0.121	0.62	96.7 ± 0.6
FUSE	9.82	0.3253	0.0064	15.2	81.1	0.514	1.60	103.1 ± 0.5
					Total-gas age			
					No plateau			102.0
R7 hornblende; J = 0.007083; wt. 0.7261 g								
850	112.45	2.826	0.1420	1.5	63.0	0.067	0.18	733.7 ± 4.1
950	51.49	7.399	0.0902	1.0	49.4	0.045	0.07	298.6 ± 2.7
1000	29.67	9.483	0.0639	1.1	38.8	0.049	0.06	141.3 ± 0.9
1050	24.76	10.85	0.0443	2.7	50.6	0.122	0.05	153.2 ± 0.8
1100	19.85	12.84	0.0301	5.2	60.2	0.235	0.04	146.5 ± 0.7
1125	15.69	13.80	0.0217	8.4	66.0	0.375	0.04	127.6 ± 0.7
1150	15.43	14.04	0.0225	9.0	64.0	0.402	0.04	121.8 ± 0.6
1175	16.20	14.25	0.0255	7.2	60.3	0.320	0.04	120.5 ± 0.6
1200	12.11	14.45	0.0133	16.0	76.8	0.714	0.04	115.0 ± 0.6
1250	10.95	14.43	0.0088	39.5	86.5	1.76	0.04	117.0 ± 0.6
FUSE	15.98	14.29	0.0261	8.5	58.8	0.380	0.04	116.0 ± 0.6
					Total-gas age			
					No plateau			133.7
R8a muscovite; J = 0.007296; wt. 0.0642 g								
750	32.87	0.9163	0.0944	0.3	15.3	0.035	0.57	65.0 ± 2.2
875	10.45	0.0143	0.0167	0.8	52.8	0.111	36.4	71.1 ± 0.4
925	8.386	0.0086	0.0089	2.0	68.6	0.256	60.7	74.1 ± 0.4
975	6.622	0.0003	0.0026	13.6	88.5	1.78	1750.0	75.5 ± 0.4
1015	6.191	0.0006	0.0011	32.1	94.5	4.20	845.0	75.4 ± 0.4
1050	6.471	0.0007	0.0022	16.1	90.1	2.11	73.0	75.2 ± 0.4
1200	7.285	0.0004	0.0050	16.8	79.5	2.20	116.0	74.7 ± 0.4
FUSE	8.363	0.0005	0.0086	18.4	69.5	2.40	95.1	74.9 ± 0.4
					Total-gas age			75.1
					Plateau age (975 °C-Fuse)			75.3 ± 0.4

Table 2 (Continued)

TEMP (°C)	$^{40}\text{Ar}/$ ^{39}Ar	$^{37}\text{Ar}/$ ^{39}Ar	$^{36}\text{Ar}/$ ^{39}Ar	^{39}Ar (% of total)	$^{40}\text{Ar}_R$ (%)	^{39}Ar (mole $\times 10^{-13}$)	Apparent K/Ca (mole/mole)	Apparent age and error ($\times 10^6$ yr)
R8a biotite; J = 0.007309; wt. 0.0630 g								
650	21.24	1.036	0.0615	0.4	14.8	0.047	0.50	41.1 ± 1.0
850	7.164	0.0168	0.0056	6.9	77.0	0.849	30.9	71.3 ± 0.4
1000	6.174	0.0017	0.0013	38.8	93.9	4.78	304.0	74.9 ± 0.4
1050	7.083	0.0420	0.0044	7.8	81.5	0.965	12.4	74.6 ± 0.4
1125	6.613	0.0178	0.0028	16.4	87.3	2.03	29.2	74.6 ± 0.4
1200	7.156	0.0134	0.0047	25.0	80.6	3.08	38.8	74.6 ± 0.4
FUSE	13.41	0.0713	0.0262	4.7	42.3	0.574	7.29	73.3 ± 0.4
					Total-gas age			74.3
					Plateau age (1,000 °C-Fuse)			74.7 ± 0.4
R8a microcline; J = 0.007244; wt. 0.0938 g								
600	22.90	0.3228	0.0495	0.2	36.2	0.049	1.61	105.2 ± 1.2
700	9.724	0.0465	0.0206	0.5	37.4	0.126	11.2	46.9 ± 0.7
800	5.203	0.0147	0.0031	1.7	82.2	0.427	35.5	55.0 ± 0.3
900	5.538	0.0168	0.0018	4.3	90.2	1.09	31.0	64.1 ± 0.3
1000	5.299	0.0118	0.0005	16.4	96.9	4.11	43.9	65.9 ± 0.3
1050	5.361	0.0057	0.0005	16.9	97.0	4.23	91.3	66.7 ± 0.3
1100	5.476	0.0042	0.0007	14.1	95.9	3.51	124.0	67.4 ± 0.4
1150	5.796	0.0098	0.0017	7.9	91.3	1.98	52.9	67.8 ± 0.3
1250	6.075	0.0182	0.0024	10.7	88.4	2.67	28.6	68.9 ± 0.4
FUSE	5.928	0.0057	0.0017	27.3	91.4	6.82	90.7	69.4 ± 0.4
					Total-gas age			67.4
					No plateau			
R10 muscovite; J = 0.007333; wt. = 0.0630 g								
750	10.85	0.2755	0.0179	1.0	51.4	0.128	1.89	72.3 ± 0.6
875	7.093	0.2519	0.0037	4.2	84.9	0.539	2.06	78.0 ± 0.4
925	6.613	0.0273	0.0021	6.5	90.4	0.833	19.0	77.4 ± 0.4
975	6.477	0.0192	0.0019	11.8	91.4	1.51	27.0	76.7 ± 0.4
1000	6.367	0.0134	0.0015	23.2	93.0	2.67	38.7	76.7 ± 0.4
1050	6.343	0.0144	0.0015	20.0	93.2	2.56	36.2	76.6 ± 0.4
FUSE	6.303	0.0104	0.0012	33.4	94.2	4.28	50.2	76.9 ± 0.4
					Total-gas age			76.8
					Plateau age (975 °C-Fuse)			76.7 ± 0.4

Table 2 (Continued)

TEMP (°C)	$^{40}\text{Ar}/$ ^{39}Ar	$^{37}\text{Ar}/$ ^{39}Ar	$^{36}\text{Ar}/$ ^{39}Ar	^{39}Ar (% of total)	$^{40}\text{Ar}_R$ (%)	^{39}Ar (mole $\times 10^{-13}$)	Apparent K/Ca (mole/mole)	Apparent age and error ($\times 10^6$ yr)
R11 hornblende; J = 0.007156; wt. 0.7533 g								
850	28.22	5.812	0.0613	0.2	37.4	0.051	0.09	131.2 ± 0.9
1000	17.17	2.094	0.0347	0.6	41.3	0.126	0.25	89.2 ± 0.9
1050	21.92	2.490	0.0497	0.5	33.8	0.110	0.21	93.2 ± 0.5
1100	9.478	3.533	0.0101	5.1	71.4	1.07	0.15	85.3 ± 0.4
1125	7.926	3.656	0.0051	9.9	84.6	2.10	0.14	84.5 ± 0.4
1150	7.632	3.656	0.0041	12.9	87.8	2.74	0.14	84.5 ± 0.4
1175	7.420	3.635	0.0032	22.4	90.9	4.75	0.14	85.0 ± 0.4
1200	7.448	3.622	0.0033	21.4	90.0	4.54	0.14	85.1 ± 0.4
1250	7.805	3.612	0.0045	14.5	86.6	3.06	0.14	85.1 ± 0.4
FUSE	8.841	3.918	0.0076	12.4	77.9	2.63	0.13	86.8 ± 0.5
					Total-gas age			85.3
					Plateau age (1,175-1,250 °C)			85.1 ± 0.4
R12 hornblende; J = 0.007363; wt. 0.8048 g								
850	33.43	1.789	0.0855	0.2	24.8	0.038	0.29	106.9 ± 1.8
950	42.14	1.635	0.1170	0.3	18.2	0.058	0.32	99.2 ± 1.4
1000	72.72	2.636	0.2220	0.2	10.0	0.034	0.20	94.1 ± 2.2
1050	20.58	4.333	0.0477	1.5	33.1	0.265	0.12	88.3 ± 0.5
1100	9.647	4.545	0.0102	11.7	72.4	2.10	0.11	90.4 ± 0.4
1125	8.616	4.520	0.0064	22.6	82.0	4.05	0.11	91.5 ± 0.5
1150	8.471	4.573	0.0056	30.0	84.8	5.38	0.11	92.9 ± 0.5
1175	10.80	4.577	0.0133	9.1	66.8	1.64	0.11	93.4 ± 0.5
1200	9.99	4.462	0.0110	13.6	71.0	2.45	0.11	91.8 ± 0.5
1250	12.84	4.432	0.0207	8.2	55.1	1.47	0.11	91.5 ± 0.5
FUSE	34.45	4.403	0.0944	2.7	20.0	4.76	0.11	89.1 ± 0.6
					Total-gas age			92.0
					No plateau			
R12 biotite; J = 0.007332; wt. 0.0680 g								
650	13.73	0.0164	0.0366	1.5	21.2	0.187	31.7	38.1 ± 0.4
850	6.876	0.0042	0.0030	26.8	86.9	3.25	123.0	77.3 ± 0.4
1000	6.887	0.0045	0.0016	27.3	92.9	3.31	117.0	82.7 ± 0.4
1050	7.155	0.0065	0.0026	13.3	89.2	1.61	80.4	82.5 ± 0.4
1125	7.469	0.0080	0.0037	11.7	85.2	1.43	65.4	82.3 ± 0.4
1200	7.914	0.0173	0.0054	12.2	79.8	1.48	30.0	81.7 ± 0.4
FUSE	10.50	0.0194	0.0143	7.2	59.7	0.875	26.8	81.1 ± 0.4
					Total-gas age			80.3
					Plateau age (1,000-1,125 °C)			82.6 ± 0.4

Table 2 (Continued)

TEMP (°C)	$^{40}\text{Ar}/$ ^{39}Ar	$^{37}\text{Ar}/$ ^{39}Ar	$^{36}\text{Ar}/$ ^{39}Ar	^{39}Ar (% of total)	$^{40}\text{Ar}_R$ (%)	^{39}Ar (mole $\times 10^{-13}$)	Apparent K/Ca (mole/mole)	Apparent age and error ($\times 10^6$ yr)
R14 hornblende; J = 0.007400; wt. 0.7880 g								
850	47.81	3.512	0.129	2.3	20.6	0.098	0.14	126.7 ± 2.0
1000	30.33	7.545	0.0804	3.2	23.6	0.135	0.07	93.1 ± 0.7
1050	22.03	13.65	0.0551	3.1	30.9	0.130	0.04	88.5 ± 0.6
1100	14.98	16.36	0.0303	10.9	48.7	0.451	0.03	94.8 ± 0.5
1125	16.49	16.77	0.0347	7.0	45.7	0.290	0.03	97.8 ± 0.6
1150	15.07	16.96	0.0301	11.8	49.7	0.488	0.03	97.1 ± 0.6
1175	14.80	17.26	0.0291	13.6	51.0	0.564	0.03	97.8 ± 0.5
1200	14.50	17.54	0.0286	14.0	51.1	0.578	0.03	96.2 ± 0.5
1250	14.00	17.47	0.0265	16.3	58.7	0.674	0.03	97.6 ± 0.5
FUSE	22.27	17.16	0.0536	17.7	34.9	0.732	0.03	100.7 ± 0.6
					Total-gas age			97.9
					No plateau			
R16 hornblende; J = 0.007254; wt. 0.7839 g								
850	46.42	2.390	0.116	0.8	26.2	0.061	0.22	152.5 ± 1.0
1000	31.54	3.964	0.0811	1.7	24.9	0.132	0.13	100.1 ± 0.7
1050	20.71	8.198	0.0476	2.4	35.2	0.186	0.06	92.8 ± 0.6
1100	11.84	9.259	0.0164	10.5	65.1	0.822	0.06	98.1 ± 0.5
1125	15.37	9.373	0.0280	12.1	50.8	0.949	0.06	99.4 ± 0.5
1150	14.06	9.186	0.0235	6.1	55.7	0.475	0.06	99.7 ± 0.5
1175	16.86	9.326	0.0335	3.4	45.6	0.265	0.06	97.7 ± 0.5
1200	14.77	9.683	0.0266	7.3	51.9	0.569	0.05	97.5 ± 0.5
1250	10.60	9.538	0.0121	16.9	73.2	1.33	0.05	98.6 ± 0.5
FUSE	10.01	9.266	0.0096	39.0	79.0	3.06	0.06	100.6 ± 0.5
					Total-gas age			99.7
					No plateau			
R16 biotite; J = 0.006750; wt. 0.0609 g								
650	5.955	0.0262	0.0103	3.8	48.9	0.347	19.8	35.1 ± 0.4
850	7.926	0.0067	0.0045	21.9	83.3	1.99	77.4	78.6 ± 0.4
1000	8.151	0.0077	0.0024	31.7	91.1	2.88	67.3	88.2 ± 0.4
1050	8.224	0.0160	0.0027	23.2	90.1	2.11	32.5	88.1 ± 0.4
1125	8.300	0.0375	0.0032	14.3	88.7	1.30	13.5	87.4 ± 0.4
1200	11.19	0.0663	0.0131	4.6	65.3	0.420	7.85	86.9 ± 0.4
FUSE	58.42	0.5734	0.1770	0.5	10.4	0.048	0.91	72.2 ± 2.7
					Total-gas age			83.8
					Plateau age (1,000-1,050 °C)			88.2 ± 0.4

Table 2 (Continued)

TEMP (°C)	$^{40}\text{Ar}/$ ^{39}Ar	$^{37}\text{Ar}/$ ^{39}Ar	$^{36}\text{Ar}/$ ^{39}Ar	^{39}Ar (% of total)	$^{40}\text{Ar}_R$ (%)	^{39}Ar (mole $\times 10^{-13}$)	Apparent K/Ca (mole/mole)	Apparent age and error ($\times 10^6$ yr)
R17 hornblende; J = 0.007350; wt. = 0.7460 g								
850	73.67	9.917	0.1050	0.8	58.9	0.056	0.05	499.7 ± 3.2
1000	48.67	5.095	0.0580	1.6	65.6	0.112	0.10	380.5 ± 1.8
1050	26.44	8.583	0.0342	3.6	64.3	0.243	0.06	212.4 ± 1.0
1100	13.25	9.668	0.0147	10.4	72.9	0.708	0.05	123.6 ± 0.6
1125	12.01	9.918	0.0142	11.8	71.4	0.808	0.05	110.1 ± 0.6
1150	12.17	9.904	0.0156	8.0	68.3	0.546	0.05	107.0 ± 0.5
1175	11.12	10.16	0.0127	8.6	73.3	0.584	0.05	104.9 ± 0.6
1200	10.09	10.28	0.0088	15.1	82.0	1.03	0.05	106.4 ± 0.5
1250	10.14	10.31	0.0088	23.5	82.3	1.60	0.05	107.3 ± 0.5
FUSE	12.14	10.24	0.0157	16.7	68.3	1.14	0.05	106.6 ± 0.5
					Total-gas age			
					No plateau			121.1
R18 hornblende; j = 0.007200; wt. 0.7413 g								
900	38.09	4.151	0.0680	0.7	48.1	0.033	0.13	223.5 ± 2.2
1000	25.57	8.557	0.0536	3.2	40.7	0.146	0.06	130.2 ± 0.7
1050	20.11	10.54	0.0398	4.2	45.6	0.192	0.05	115.1 ± 1.7
1100	12.80	13.12	0.0164	21.5	70.0	0.981	0.04	112.7 ± 0.6
1125	13.32	13.31	0.0187	13.0	66.2	0.595	0.04	111.1 ± 0.6
1150	11.22	13.22	0.0130	17.8	74.9	0.811	0.04	105.9 ± 0.5
1175	11.12	12.96	0.0121	6.9	77.0	0.315	0.04	107.9 ± 0.6
1200	11.11	13.48	0.0128	11.3	75.3	0.517	0.04	105.4 ± 0.6
1250	11.83	13.31	0.0145	16.8	72.6	0.765	0.04	198.2 ± 0.6
FUSE	18.83	13.31	0.0389	4.6	44.5	0.210	0.04	195.2 ± 0.6
					Total-gas age			
					No plateau			110.5
R18 biotite; J = 0.007272; wt. 0.0712 g								
850	10.03	0.0127	0.0038	11.6	88.9	1.35	40.9	113.4 ± 0.6
1000	10.01	0.0118	0.0027	30.5	91.9	3.55	44.2	116.9 ± 0.6
1050	10.08	0.0217	0.0032	21.8	90.6	2.54	24.0	116.0 ± 0.6
1100	10.43	0.1098	0.0045	20.7	87.2	2.41	4.74	115.5 ± 0.6
1200	12.19	0.0792	0.0104	13.5	74.8	6.56	6.56	115.9 ± 0.6
FUSE	53.29	0.2905	0.1510	1.8	16.3	0.215	1.79	110.5 ± 0.9
					Total-gas age			115.7
					Plateau age (1,050-1,200 °C)			115.8 ± 0.6

Table 2 (Continued)

TEMP (°C)	$^{40}\text{Ar}/$ ^{39}Ar	$^{37}\text{Ar}/$ ^{39}Ar	$^{36}\text{Ar}/$ ^{39}Ar	^{39}Ar (% of total)	$^{40}\text{Ar}_R$ (%)	^{39}Ar (mole $\times 10^{-13}$)	Apparent K/Ca (mole/mole)	Apparent age and error ($\times 10^6$ yr)
R20 hornblende; J = 0.007210; wt. 0.8099 g								
850	69.45	6.893	0.1620	0.4	31.8	0.032	0.08	266.7 ± 4.1
950	59.35	9.580	0.1430	0.6	30.1	0.048	0.05	218.6 ± 3.8
1000	56.01	10.42	0.1330	0.4	31.4	0.033	0.05	215.1 ± 1.7
1050	42.17	10.36	0.0790	1.4	46.6	0.106	0.05	238.8 ± 1.5
1100	34.14	9.420	0.0532	2.1	56.1	0.165	0.06	233.2 ± 1.3
1125	31.37	8.953	0.0447	2.9	60.1	0.223	0.06	229.8 ± 1.2
1150	23.89	8.612	0.0195	7.7	78.7	0.602	0.06	229.1 ± 1.1
1175	22.07	8.523	0.0136	14.7	84.8	1.15	0.06	228.3 ± 1.1
1200	21.36	8.478	0.0118	20.6	86.8	1.61	0.06	226.3 ± 1.3
1250	21.23	8.475	0.0115	25.8	87.1	2.02	0.06	225.8 ± 1.1
FUSE	22.54	8.834	0.1540	23.4	82.9	1.83	0.06	227.9 ± 1.1
					Total-gas age			
					No plateau			227.5
R21 hornblende; J = 0.006690; wt. 0.7187 g								
850	41.19	2.472	0.1120	0.9	19.8	0.165	0.21	96.9 ± 1.0
950	16.72	1.181	0.0338	1.1	40.8	0.187	0.44	80.5 ± 0.5
1000	22.87	2.449	0.0533	0.5	31.9	0.086	0.21	86.0 ± 0.9
1050	15.85	3.403	0.0304	1.1	44.9	0.96	0.15	83.8 ± 0.5
1100	9.506	3.694	0.0090	7.0	74.9	1.23	0.14	83.9 ± 0.4
1125	8.918	3.695	0.0070	8.5	79.9	1.51	0.14	84.0 ± 0.4
1150	8.725	3.700	0.0064	13.7	81.6	2.42	0.14	83.9 ± 0.4
1175	8.695	3.702	0.0063	16.6	81.8	2.93	0.14	83.8 ± 0.4
1200	8.184	3.700	0.0046	24.8	86.8	4.39	0.14	83.7 ± 0.4
1250	8.412	3.767	0.0053	23.9	84.9	4.23	0.14	84.2 ± 0.4
FUSE	39.13	3.855	0.1110	1.9	17.2	3.40	0.14	79.4 ± 0.5
					Total-gas age			83.9
					Plateau age (1,050-1,250 °C)			83.9 ± 0.4
R21 biotite; J = 0.007000; wt. 0.0698 g								
850	7.113	0.0040	0.0024	21.2	89.9	2.60	131.0	79.1 ± 0.4
1000	6.895	0.0045	0.0011	32.6	95.4	4.01	115.0	81.3 ± 0.4
1050	6.998	0.0081	0.0014	20.1	93.9	2.47	63.9	81.1 ± 0.4
1100	7.292	0.0128	0.0025	16.6	89.9	2.03	40.5	81.1 ± 0.4
1250	10.22	0.0448	0.0126	8.4	63.6	1.03	11.6	80.5 ± 0.4
FUSE	55.45	0.2324	0.1680	1.1	10.4	0.140	2.24	71.6 ± 0.3
					Total-gas age			80.5
					Plateau age (1,000-1,100 °C)			81.1 ± 0.4

Table 2 (Continued)

TEMP (°C)	$^{40}\text{Ar}/$ ^{39}Ar	$^{37}\text{Ar}/$ ^{39}Ar	$^{36}\text{Ar}/$ ^{39}Ar	^{39}Ar (% of total)	$^{40}\text{Ar}_R$ (%)	^{39}Ar (mole $\times 10^{-13}$)	Apparent K/Ca (mole/mole)	Apparent age and error ($\times 10^6$ yr)
R21 microcline; J = 0.007313; wt. 0.0823 g								
600	33.85	0.0047	0.0882	0.1	23.0	0.025	111.0	99.7 ± 2.1
700	7.964	0.0014	0.0073	0.5	72.9	0.109	365.0	75.0 ± 0.6
800	6.153	0.0014	0.0013	3.8	93.9	0.809	380.0	74.7 ± 0.7
900	5.943	0.0008	0.0004	11.2	97.7	2.41	651.0	75.0 ± 0.4
1000	6.031	0.0007	0.0006	24.2	97.2	5.21	790.0	75.7 ± 0.4
1050	6.261	0.0004	0.0015	8.0	93.0	1.72	1360.0	75.2 ± 0.4
1100	6.705	0.0004	0.0025	8.6	88.9	1.85	1210.0	77.0 ± 0.4
1150	7.469	0.0004	0.0047	19.9	81.5	4.29	1430.0	78.6 ± 0.4
FUSE	8.209	0.0002	0.0073	16.8	73.6	3.62	2220.0	78.0 ± 0.4
					Total-gas age			76.8
					No plateau			
R22 hornblende; J = 0.007373; wt. 0.8212 g								
850	33.35	2.632	0.0848	0.5	25.5	0.089	0.20	109.7 ± 1.0
950	20.98	3.023	0.0481	0.7	33.4	0.131	0.17	90.7 ± 0.7
1000	14.87	3.844	0.0277	0.9	47.0	0.170	0.14	90.6 ± 0.5
1050	8.267	4.180	0.0058	7.5	83.3	1.42	0.12	89.3 ± 0.5
1100	8.317	4.270	0.0061	5.3	82.2	0.994	0.12	88.7 ± 0.5
1125	13.30	4.225	0.0233	1.6	50.8	0.297	0.12	87.6 ± 0.5
1150	10.59	4.285	0.0138	3.8	64.7	0.720	0.12	88.8 ± 0.4
1175	9.021	4.335	0.0087	5.3	75.3	0.989	0.12	88.1 ± 0.4
1200	8.662	4.338	0.0074	12.8	78.6	2.41	0.12	88.3 ± 0.4
1250	7.909	4.585	0.0048	24.6	86.6	4.63	0.11	88.9 ± 0.4
FUSE	8.055	4.495	0.0050	37.0	85.9	6.97	0.12	89.7 ± 0.4
					Total-gas age			89.2
					No plateau			
R23 hornblende; J = 0.006873; wt. 0.7618 g								
850	41.74	3.891	0.1200	0.3	15.6	0.038	0.13	79.0 ± 2.1
950	30.64	2.846	0.0827	0.3	20.9	0.046	0.18	77.8 ± 1.2
1000	40.32	3.806	0.1120	0.2	18.3	0.031	0.14	89.4 ± 2.2
1050	36.57	5.822	0.0997	0.4	20.7	0.058	0.09	91.5 ± 1.2
1100	15.02	6.494	0.0265	2.3	51.1	0.312	0.08	92.8 ± 0.5
1125	10.65	5.547	0.0114	4.6	72.5	0.643	0.09	93.2 ± 0.5
1150	9.471	5.491	0.0072	10.6	82.2	1.47	0.09	94.0 ± 0.5
1175	9.209	5.304	0.0059	18.0	85.6	2.50	0.10	95.1 ± 0.5
1200	9.261	5.105	0.0052	21.0	87.5	2.91	0.10	97.8 ± 0.5
1250	9.505	5.045	0.0058	19.7	86.0	2.73	0.10	98.6 ± 0.5
FUSE	10.09	5.087	0.0076	22.6	81.7	3.13	0.10	99.4 ± 0.5
					Total-gas age			96.9
					No plateau			

Table 2 (Continued)

TEMP (°C)	$^{40}\text{Ar}/$ ^{39}Ar	$^{37}\text{Ar}/$ ^{39}Ar	$^{36}\text{Ar}/$ ^{39}Ar	^{39}Ar (% of total)	$^{40}\text{Ar}_R$ (%)	^{39}Ar (mole $\times 10^{-13}$)	Apparent K/Ca (mole/mole)	Apparent age and error ($\times 10^6$ yr)
R24 hornblende; J = 0.006832; wt. 0.8055 g								
850	53.59	2.530	0.140	1.1	23.1	0.057	0.21	146.3 ± 4.3
950	31.43	1.839	0.0797	1.4	25.5	0.071	0.28	96.2 ± 0.7
1000	41.07	4.490	0.118	1.1	16.1	0.057	0.12	79.7 ± 1.7
1050	49.52	8.973	0.148	1.3	13.2	0.068	0.06	78.5 ± 0.9
1100	31.95	12.35	0.0866	3.2	22.9	0.160	0.05	88.0 ± 0.8
1125	20.89	13.26	0.0486	4.3	36.2	0.218	0.04	90.8 ± 0.5
1150	14.74	13.56	0.0275	11.1	52.0	0.556	0.04	91.9 ± 0.5
1175	12.42	13.63	0.0197	26.6	61.6	1.33	0.04	91.9 ± 0.5
1200	19.19	13.67	0.0432	8.8	39.1	0.442	0.04	90.1 ± 0.5
1250	13.97	13.65	0.0248	19.2	55.2	0.963	0.04	92.6 ± 0.5
FUSE	15.61	13.56	0.0308	21.9	48.5	1.10	0.04	90.8 ± 0.5
					Total-gas age			
					No plateau			91.8
R24 muscovite; J = 0.007107; wt. 0.580 g								
750	15.95	0.0350	0.0342	0.7	36.6	0.095	14.9	73.3 ± 1.2
875	8.797	0.0117	0.0068	2.0	77.2	0.252	44.4	85.0 ± 0.5
925	7.856	0.0016	0.0037	3.6	86.1	0.465	333.0	84.7 ± 0.4
975	7.749	0.0007	0.0037	5.7	85.9	0.731	743.0	83.8 ± 0.4
1050	7.711	0.0	0.0035	12.6	86.4	1.61	0.0	83.5 ± 0.4
1150	7.235	0.0	0.0019	23.3	92.0	2.98	0.0	83.4 ± 0.4
1200	7.374	0.0004	0.0024	42.4	90.4	5.42	1160.0	83.5 ± 0.4
FUSE	11.76	0.0026	0.0174	9.6	56.2	1.23	196.0	82.7 ± 0.4
					Total-gas age			83.4
					Plateau age (975-1,200 °C)			83.44 ± 0.4
R24 microcline; J = 0.007168; wt. 0.0713 g								
600	22.35	0.0344	0.0343	0.6	54.7	0.097	15.1	151.5 ± 0.8
700	6.470	0.0273	0.0033	1.3	84.7	0.225	19.1	69.5 ± 0.4
800	6.118	0.0207	0.0011	4.7	94.5	0.793	25.1	73.3 ± 0.4
900	6.141	0.0073	0.0005	12.6	97.4	2.15	71.6	75.8 ± 0.4
1000	6.245	0.0097	0.0006	13.4	96.9	2.28	53.8	76.6 ± 0.4
1050	6.611	0.0091	0.0017	10.6	92.2	1.81	57.2	77.2 ± 0.4
1100	6.967	0.0094	0.0029	10.0	87.7	1.71	55.3	77.3 ± 0.4
1100	7.426	0.0127	0.0043	12.9	82.9	2.19	41.0	78.8 ± 0.4
1250	7.669	0.0118	0.0071	15.8	81.2	2.69	44.1	79.0 ± 0.4
FUSE	8.346	0.0062	0.0071	18.0	74.8	3.06	83.9	
					Total-gas age			
					No plateau			77.8

Table 2 (Continued)

TEMP (°C)	$^{40}\text{Ar}/$ ^{39}Ar	$^{37}\text{Ar}/$ ^{39}Ar	$^{36}\text{Ar}/$ ^{39}Ar	^{39}Ar (% of total)	$^{40}\text{Ar}_R$ (%)	^{39}Ar (mole $\times 10^{-13}$)	Apparent K/Ca (mole/mole)	Apparent age and error ($\times 10^6$ yr)
R25 biotite; J = 0.007340; wt. 0.0628 g								
650	23.95	0.2735	0.0674	0.3	16.9	0.034	1.90	52.8 ± 0.7
850	7.834	0.1717	0.0054	5.8	79.8	0.646	3.03	81.0 ± 0.4
1000	7.024	0.0105	0.0018	27.0	92.5	2.99	49.5	84.0 ± 0.4
1050	7.110	0.0080	0.0021	16.0	91.4	1.77	65.3	84.0 ± 0.4
1125	7.052	0.0105	0.0019	35.0	92.2	3.87	49.5	84.1 ± 0.4
1200	8.109	0.0975	0.0054	14.3	80.3	0.58	36.1	84.2 ± 0.4
FUSE	29.95	0.0975	0.0809	1.7	20.2	0.183	5.34	78.3 ± 0.7
					Total-gas age			83.7
					Plateau age (1,000-1,200 °C)			84.1 ± 0.4
R26 hornblende; J = 0.006691; wt. 0.7132 g								
850	36.21	3.767	0.0903	2.3	27.1	0.223	0.14	114.6 ± 0.8
950	17.82	3.902	0.0343	2.1	44.7	0.199	0.13	93.7 ± 0.5
1000	17.45	5.923	0.0329	1.6	46.8	0.151	0.09	96.0 ± 0.5
1050	11.75	6.486	0.0118	6.3	74.6	0.605	0.08	102.8 ± 0.5
1100	10.57	6.172	0.0065	22.3	86.3	2.15	0.08	106.8 ± 0.5
1125	11.06	6.127	0.0076	14.7	84.8	1.42	0.09	108.8 ± 0.5
1150	11.73	6.201	0.0100	7.1	79.0	0.684	0.08	108.5 ± 0.5
1175	18.81	6.099	0.0341	2.0	49.0	0.192	0.09	107.8 ± 0.6
1200	17.77	6.254	0.0310	2.8	51.2	0.783	0.08	106.7 ± 0.6
1250	13.53	6.337	0.0162	8.1	68.2	0.783	0.08	108.0 ± 0.6
FUSE	11.75	6.281	0.0099	30.9	79.3	2.98	0.08	109.0 ± 0.6
					Total-gas age			107.5
					No plateau			
R26 biotite; J = 0.007327; wt. 0.0697 g								
650	9.944	0.0634	0.0217	0.8	35.5	0.093	8.20	46.1 ± 0.7
850	7.476	0.0133	0.0028	13.8	89.1	1.59	39.0	85.9 ± 0.4
1000	7.423	0.0099	0.0015	35.4	93.9	4.07	52.7	89.9 ± 0.4
1050	7.440	0.0211	0.0015	21.6	94.1	2.49	24.7	90.8 ± 0.5
1125	7.549	0.0257	0.0020	23.1	92.3	2.67	20.2	89.8 ± 0.5
1200	10.84	0.0775	0.0132	4.6	64.1	0.529	6.71	89.7 ± 0.5
FUSE	49.72	0.1644	0.1480	0.6	11.9	0.074	3.16	76.8 ± 0.8
					Total-gas age			89.0
					Plateau age (1,000-1,200 °C)			89.9 ± 0.6

Table 2 (Continued)

TEMP (°C)	$^{40}\text{Ar}/$ ^{39}Ar	$^{37}\text{Ar}/$ ^{39}Ar	$^{36}\text{Ar}/$ ^{39}Ar	^{39}Ar (% of total)	$^{40}\text{Ar}_R$ (%)	^{39}Ar (mole $\times 10^{-13}$)	Apparent K/Ca (mole/mole)	Apparent age and error ($\times 10^6$ yr)
R27 hornblende; J = 0.007171; wt. 0.7382 g								
850	47.94	5.651	0.1280	2.0	21.9		0.09	130.8 ± 1.6
950	31.97	6.827	0.0723	1.6	34.8	0.099	0.08	138.4 ± 1.0
1000	26.49	8.640	0.0634	1.5	31.8	0.078	0.06	105.7 ± 0.7
1050	19.93	14.02	0.0400	4.1	46.2	0.074	0.04	115.2 ± 0.6
1100	18.00	15.19	0.0344	8.5	50.0	0.199	0.03	112.8 ± 0.6
1125	17.27	14.51	0.032	9.0	51.6	0.409	0.04	111.6 ± 0.6
1150	18.86	15.44	0.0383	7.3	46.4	0.436	0.03	109.7 ± 0.6
1175	14.09	15.09	0.0226	14.3	61.6	0.350	0.03	108.9 ± 0.6
1200	18.51	15.19	0.0371	9.8	47.2	0.689	0.03	109.5 ± 0.6
1250	14.13	15.20	0.0220	16.7	62.4	0.805	0.03	110.6 ± 0.6
FUSE	15.17	15.30	0.0251	25.2	59.0	1.21	0.03	112.1 ± 0.6
					Total-gas age			111.8
					No plateau			
R28 hornblende; J = 0.007334; wt. 0.7885 g								
850	13.40	1.383	0.0187	1.3	59.5	0.232	0.38	102.4 ± 0.6
1000	9.694	0.2511	0.0065	3.8	80.3	0.664	2.07	100.1 ± 0.5
1050	12.61	1.384	0.0164	1.9	62.4	0.332	0.38	101.3 ± 0.5
1100	10.57	3.429	0.0089	6.2	77.7	1.10	0.15	105.5 ± 0.5
1125	9.608	4.211	0.0055	10.4	86.5	1.83	0.12	106.7 ± 0.5
1150	9.457	4.454	0.0050	9.5	88.1	1.67	0.12	107.0 ± 0.5
1175	9.301	4.538	0.0045	13.2	89.6	2.31	0.11	107.9 ± 0.5
1200	9.451	4.582	0.0049	8.8	88.5	1.55	0.11	107.4 ± 0.5
1250	8.882	4.737	0.0027	20.6	95.1	3.62	0.11	108.4 ± 0.5
FUSE	9.043	4.755	0.0034	24.2	93.1	4.24	0.11	108.0 ± 0.5
					Total-gas age			107.0
					No plateau			
R29 hornblende; J = 0.007326; wt. 0.7110 g								
850	37.06	1.997	0.0974	0.5	22.8	0.0634	0.26	108.3 ± 1.0
1000	26.75	2.067	0.0671	0.6	26.4	0.0753	0.25	91.0 ± 0.7
1050	25.30	4.713	0.0622	0.7	28.8	0.0902	0.11	93.9 ± 0.7
1100	11.08	5.556	0.0107	6.7	75.4	0.847	0.09	107.1 ± 0.6
1125	9.86	5.528	0.0064	12.0	85.2	1.52	0.09	107.7 ± 0.5
1150	9.86	5.524	0.0064	12.2	85.3	1.55	0.09	108.0 ± 0.5
1175	9.68	5.469	0.0057	16.9	87.1	2.14	0.09	108.1 ± 0.5
1200	9.17	5.486	0.0039	29.0	92.0	3.67	0.09	108.2 ± 0.6
1250	11.76	5.495	0.0126	6.8	71.8	0.860	0.09	108.3 ± 0.6
FUSE	11.00	5.439	0.0101	14.6	76.8	1.85	0.09	108.3 ± 0.6
					Total-gas age			107.8
					Plateau age (1,125 °C-Fuse)			108.1 ± 0.5

Table 2 (Continued)

TEMP (°C)	$^{40}\text{Ar}/$ ^{39}Ar	$^{37}\text{Ar}/$ ^{39}Ar	$^{36}\text{Ar}/$ ^{39}Ar	^{39}Ar (% of total)	$^{40}\text{Ar}_R$ (%)	^{39}Ar (mole $\times 10^{-13}$)	Apparent K/Ca (mole/mole)	Apparent age and error ($\times 10^6$ yr)
R30 hornblende; J = 0.007093; wt. 0.7041 g								
850	32.43	4.138	0.0394	0.6	65.1	0.0737	0.13	251.7 ± 1.3
1000	34.83	2.530	0.0802	0.0	32.5	0.0051	0.21	139.3 ±
12.6(?)								
1050	21.03	4.717	0.0412	1.1	43.8	0.135	0.11	114.2 ± 0.6
1100	12.58	5.424	0.0124	4.6	74.5	0.545	0.10	116.2 ± 0.6
1125	11.19	5.471	0.0070	6.7	85.2	0.797	0.10	118.0 ± 0.6
1150	16.73	5.416	0.0054	11.2	89.1	1.34	0.10	118.4 ± 0.6
1200	10.65	5.376	0.0051	28.7	87.7	1.44	0.10	118.5 ± 0.6
1250	10.80	5.386	0.0059	12.2	87.7	1.44	0.10	117.3 ± 0.6
FUSE	10.31	5.353	0.0041	34.8	92.4	4.13	0.10	117.9 ± 0.6
					Total-gas age			118.8
					No plateau			
R34 hornblende; J = 0.007270; wt. 0.8333 g								
850	42.59	2.597	0.116	1.9	19.7	0.105	0.20	106.6 ± 1.7
950	20.31	12.60	0.0428	3.5	42.6	0.188	0.04	109.9 ± 0.6
1000	18.02	13.72	0.0354	3.8	47.8	0.208	0.04	109.5 ± 0.6
1050	13.97	13.57	0.0214	8.1	62.3	0.438	0.04	110.5 ± 0.6
1100	12.28	13.39	0.0159	16.6	70.1	0.902	0.04	109.5 ± 0.6
1125	11.69	13.42	0.0142	16.2	73.1	0.881	0.04	108.7 ± 0.6
1150	11.87	13.55	0.0146	14.1	72.5	0.765	0.04	109.3 ± 0.6
1175	12.55	13.61	0.0170	8.7	68.5	0.470	0.04	109.3 ± 0.6
1200	13.44	13.65	0.0202	9.3	63.4	0.503	0.04	108.3 ± 0.6
1250	14.54	13.56	0.0238	9.6	58.9	0.519	0.04	108.8 ± 0.6
FUSE	18.87	13.52	0.0382	8.3	45.7	0.453		109.5 ± 0.6
					Total-gas age			109.2
					No plateau			
R35 muscovite; J = 0.007387; wt. 0.0622 g								
750	12.49	0.8865	0.0205	0.6	51.9	0.069	0.59	84.4 ± 0.7
875	9.735	0.6722	0.0077	2.0	77.3	0.216	0.77	97.5 ± 0.5
925	8.667	0.0384	0.0041	4.6	86.0	0.506	13.6	96.7 ± 0.5
975	8.195	0.0112	0.0021	13.6	92.4	1.49	46.5	98.2 ± 0.5
1015	7.959	0.0010	0.0012	25.4	95.3	2.79	53.4	98.4 ± 0.5
1200	8.062	0.0023	0.0011	36.2	95.8	3.98	23.0	99.4 ± 0.5
FUSE	10.36	0.2632	0.0088	4.3	75.1	0.475	1.98	100.9 ± 0.5
					Total-gas age			98.6
					Plateau age (975°-1,200 °C)			98.3 ± 0.4

Table 2 (Continued)

TEMP (°C)	$^{40}\text{Ar}/$ ^{39}Ar	$^{37}\text{Ar}/$ ^{39}Ar	$^{36}\text{Ar}/$ ^{39}Ar	^{39}Ar (% of total)	$^{40}\text{Ar}_R$ (%)	^{39}Ar (mole x10 ⁻¹³)	Apparent K/Ca (mole/mole)	Apparent age and error (x10 ⁶ yr)
7-30-5 hornblende; dJ = 0.005480; wt. 1.1493 g								
650	204.1	5.543	0.3470	0.4	50.0	0.821	0.09	801.8 ± 4.2
850	44.28	3.574	0.1020	0.8	32.7	1.84	0.15	137.8 ± 0.8
950	15.08	3.792	0.0124	6.0	77.7	13.2	0.14	112.2 ± 0.6
1000	15.26	3.804	0.0130	4.6	76.7	10.1	0.14	112.1 ± 0.7
1050	13.78	3.789	0.0084	8.4	84.0	18.5	0.14	111.0 ± 0.6
1100	12.72	3.774	0.0046	26.4	91.5	57.9	0.14	111.5 ± 0.5
1150	12.54	3.784	0.0039	25.3	93.0	55.6	0.14	111.8 ± 0.6
1200	12.52	3.823	0.0035	21.9	94.1	48.0	0.14	112.8 ± 0.6
1250	16.17	3.791	0.0156	2.8	73.2	6.15	0.14	113.4 ± 0.6
1350	17.16	3.782	0.0193	2.7	68.5	6.02	0.14	112.5 ± 0.6
1450	49.32	3.781	0.1270	0.4	24.4	0.862	0.14	115.4 ± 1.2
FUSE	81.01	3.790	0.2330	0.2	15.3	0.419	0.14	118.3 ± 3.6
				Total-gas age				115.4
				Plateau age (1,100-1,150 °C)				111.6 ± 0.6
Hcm-23 hornblende; J = 0.004577								
900	789.8	39.78	2.579	3.53	3.9	1.5	0.01	246.6 ± 214.7
1000	198.1	17.02	0.5702	2.44	15.7	1.0	0.03	242.7 ± 96.9
1050	61.22	19.60	0.1165	16.44	46.4	6.9	0.03	223.5 ± 11.4
1120	38.29	16.40	0.0380	24.35	74.2	10.2	0.03	223.1 ± 6.1
FUSE	51.16	16.78	0.0816	53.24	55.6	22.3	0.03	223.2 ± 5.8
				Total-gas age				224.5
				Plateau age (1,050°C-Fuse)				223.3 ± 5.9
Hdh-24 hornblende; J = 0.005570								
800	99.97	13.86	0.2784	2.48	18.9	4.1	0.04	181.8 ± 22.4
1000	66.40	14.48	0.1543	2.76	33.1	4.6	0.04	210.7 ± 18.1
1050	51.58	12.02	0.1007	2.60	44.3	4.3	0.04	217.7 ± 14.6
1150	38.58	7.96	0.5670	69.05	58.3	114.1	0.07	214.1 ± 3.2
FUSE	35.38	11.74	0.0448	23.11	65.3	38.2	0.04	220.1 ± 3.8
				Total-gas age				214.7
				Plateau age (1,050-1,150 °C)				215.6 ± 3.6
Hdh-25 hornblende; Jnew = 0.005570								
1025	33.34	7.68	0.0386	18.28	67.7	39.4	0.07	214.8 ± 3.5
1075	24.39	7.64	0.0089	54.25	91.8	116.8	0.07	213.2 ± 2.5
1150	24.88	7.79	0.0112	11.91	89.2	25.6	0.07	211.4 ± 3.1
FUSE	24.92	7.96	0.0115	15.57	89.0	33.5	0.07	211.3 ± 2.9
				Total-gas age				213.0
				Plateau age (1,025 °C-Fuse)				213.0 ± 2.0

Table 2 (Continued)

TEMP (°C)	$^{40}\text{Ar}/$ ^{39}Ar	$^{37}\text{Ar}/$ ^{39}Ar	$^{36}\text{Ar}/$ ^{39}Ar	^{39}Ar (% of total)	$^{40}\text{Ar}_R$ (%)	^{39}Ar (mole $\times 10^{-13}$)	Apparent K/Ca (mole/mole)	Apparent age and error ($\times 10^6$ yr)
Hdh-27 hornblende; J_{new} = 005570								
900	171.3	13.19	0.4985	2.26	14.6	3.6	0.04	238.0 ± 33.1
1025	27.54	9.94	0.0153	40.60	86.6	64.3	0.05	226.5 ± 2.9
1075	25.35	9.80	0.0089	35.14	92.8	55.6	0.05	223.7 ± 2.8
1100	28.20	10.65	0.0181	7.35	84.2	11.6	0.05	225.6 ± 4.1
FUSE	26.95	11.25	0.0142	14.65	87.9	23.2	0.05	225.3 ± 3.6
					Total-gas age			225.5
					Plateau age (1,025 °C-Fuse)			225.0 ± 2.3
HKc-29 biotite; J = 0.003578								
600	16.68	---	0.0202	7.22	64.2	11.5	---	67.8 ± 2.5
800	38.32	---	0.0057	32.41	95.6	51.5	---	222.2 ± 2.6
900	40.73	---	0.0078	13.39	94.3	21.3	---	232.4 ± 3.1
1025	40.28	---	0.0036	27.89	97.3	44.3	---	236.8 ± 2.8
FUSE	41.25	---	0.0114	19.09	91.8	30.3	---	229.3 ± 2.8
					Total-gas age			218.3
					Plateau age (900 °C-Fuse)			233.5 ± 2.5
HKc-32 hornblende; J = 0.005570								
900	32.33	5.45	0.0345	9.33	69.9	21.7	0.10	214.6 ± 4.1
1025	27.05	6.61	0.0137	36.40	87.0	84.6	0.08	223.3 ± 2.8
1075	29.12	6.51	0.0188	10.14	82.7	23.6	0.08	228.2 ± 3.7
1100	25.78	6.49	0.0078	21.45	93.1	49.9	0.08	227.5 ± 2.8
FUSE	26.76	6.69	0.0096	22.68	91.5	52.7	0.08	231.6 ± 2.9
					Total-gas age			225.8
					Plateau age (1,075 °C-Fuse)			229.3 ± 2.6
HKc-34 hornblende; J_{new} = 0.005570								
900	211.8	29.78	0.6497	2.02	10.5	0.9	0.02	215.4 ± 103.1
1025	298.4	28.81	0.9512	2.97	6.6	1.3	0.02	191.9 ± 112.8
1075	59.33	30.56	0.1318	12.02	38.6	5.1	0.02	221.4 ± 15.3
1100	36.56	29.54	0.0534	40.63	63.5	17.3	0.02	224.0 ± 5.4
FUSE	63.50	31.20	0.1433	42.36	37.4	18.1	0.02	228.9 ± 7.8
					Total-gas age			224.6
					Plateau age (1,100 °C-Fuse)			225.8 ± 6.7

Table 2 (Continued)

TEMP (°C)	$^{40}\text{Ar}/$ ^{39}Ar	$^{37}\text{Ar}/$ ^{39}Ar	$^{36}\text{Ar}/$ ^{39}Ar	^{39}Ar (% of total)	$^{40}\text{Ar}_R$ (%)	^{39}Ar (mole $\times 10^{-13}$)	Apparent K/Ca (mole/mole)	Apparent age and error ($\times 10^6$ yr)
HKc-35 hornblende; J = 005570								
900	154.8	23.87	0.4253	2.84	20.1	1.3	0.02	293.3 ± 60.9
1025	75.12	32.31	0.1802	17.82	32.7	8.1	0.02	236.4 ± 11.8
1075	36.01	31.56	0.0474	31.31	68.4	14.3	0.02	236.9 ± 6.0
FUSE	32.65	33.51	0.0346	48.04	77.2	21.9	0.02	242.4 ± 4.2
					Total-gas age			241.1
					Plateau age (1,025 °C-Fuse)			239.2 ± 7.6
HKc-36 hornblende; J = 0.003585								
800	53.83	4.64	0.0935	10.31	49.4	8.6	0.11	164.8 ± 5.8
1025	44.59	24.60	0.0275	35.09	86.3	29.4	0.02	237.2 ± 3.1
1070	42.50	26.51	0.0217	24.28	90.1	20.3	0.02	236.4 ± 3.2
1100	43.68	27.47	0.0243	11.17	88.8	9.4	0.02	239.2 ± 3.9
FUSE	45.07	27.11	0.0262	19.15	87.8	16.0	0.02	243.8 ± 3.7
					Total-gas age			231.0
					Plateau age (1,025 °C-Fuse)			238.6 ± 3.4
HKc-36 biotite; J = 0.003578								
600	65.10	---	0.1944	8.64	11.8	8.9	---	48.8 ± 8.3
800	50.52	---	0.0459	34.66	73.1	35.7	---	223.9 ± 3.3
900	73.23	---	0.1140	15.06	54.0	15.5	---	238.7 ± 5.6
1025	59.43	---	0.0649	24.10	67.7	24.8	---	242.6 ± 3.9
FUSE	73.24	---	0.1209	17.53	51.2	18.1	---	227.3 ± 5.1
					Total-gas age			216.8
					No plateau			
HKc-37 hornblende; J = 0.004577								
950	55.11	9.60	0.0859	7.29	55.4	6.7	0.05	237.4 ± 10.6
1025	43.41	16.08	0.0450	11.85	72.4	10.9	0.03	245.3 ± 6.8
1070	37.68	14.23	0.0253	28.25	83.3	25.9	0.04	244.4 ± 4.1
1125	33.17	11.93	0.0143	26.85	90.2	24.6	0.04	233.5 ± 3.4
FUSE	34.07	13.44	0.0164	25.77	89.0	23.6	0.04	236.6 ± 3.6
					Total-gas age			239.1
					Plateau age (1,125 °C-Fuse)			235.0 ± 3.5

Table 2 (Continued)

TEMP (°C)	$^{40}\text{Ar}/$ ^{39}Ar	$^{37}\text{Ar}/$ ^{39}Ar	$^{36}\text{Ar}/$ ^{39}Ar	^{39}Ar (% of total)	$^{40}\text{Ar}_R$ (%)	^{39}Ar (mole $\times 10^{-13}$)	Apparent K/Ca (mole/mole)	Apparent age and error ($\times 10^6$ yr)
Hcop-39 hornblende; J = 0.004577								
900	307.1	20.32	0.9538	7.35	8.8	3.1	0.03	212.8 ± 74.2
1000	274.7	11.73	0.8461	3.02	9.3	1.3	0.04	201.7 ± 99.7
1050	129.9	19.28	0.3603	3.23	19.3	1.4	0.03	198.6 ± 56.8
1100	43.43	31.73	0.0554	44.42	66.4	18.9	0.02	227.1 ± 4.9
FUSE	43.92	20.92	0.0562	41.97	66.1	17.9	0.02	228.4 ± 5.9
					Total-gas age			224.9
					Plateau age (1,100 °C-Fuse)			227.8 ± 5.3
Hcop-40 hornblende; J = 0.005570								
900	29.29	14.01	0.0302	29.72	73.5	28.9	0.04	206.4 ± 3.6
1000	23.20	14.75	0.0090	41.14	94.1	40.0	0.04	217.5 ± 2.9
1050	34.28	14.55	0.0414	3.66	67.9	3.6	0.04	221.9 ± 13.7
1100	32.66	14.23	0.0396	4.34	67.8	4.2	0.04	211.8 ± 13.2
FUSE	28.75	15.29	0.0223	21.15	81.4	20.6	0.03	223.5 ± 4.1
					Total-gas age			215.4
					Plateau age (1,000 °C-Fuse)			219.2 ± 7.0